ed: Which being a caſe ſo very odd, and never (that I have ever met with) taken notice of before, I have thought it a part of my Duty I owe to this ingenious and learned *Society*, to acquaint you with it; hoping it may give ſome lucky hint to ſome Ingenious Perſon, for the better diſcovery of that intricate ſubject, concerning the Nature of Magnetick Bodies.

VII. *Farther Obſervations and Remarks on the ſame Subject.*

I Lately gave the Society an account of the *Deſtruction of the Magnetick Virtue* in a touched piece of Iron Wire, by *Bending*, or *Coyling round*: Which I thought had been a Novelty. But by looking over more accurately what others have written of Magneticks, I find in *Grimaldi de Lumine* and *Colore*, that he, and in our *Phil. Tranſactions*, N. 188, that *Mr de la Hire* had hit upon the ſame diſcovery before me. However, they having not proſecuted their Diſcovery ſo far as I did, and my account containing divers things not taken notice of by them, I hope what I ſent the Society was not unacceptable.

And indeed it is very happy for me that I have the Authority of ſo Ingenious Perſons on my ſide, becauſe the Experiment not ſucceeding in ſome tryals ſince, I have had reaſon to fear leſt the Society might call my Integrity in queſtion.

The matter of fact was thus, and to me ſurprizing: I touched and coyled ſeveral Iron Wires, but the effect that enſued was not ſuch as I told the Society. The Verticity was indeed much weakened, but not totally deſtroyed, and the ends of the Wires would be attracted or repelled by by the Poles of the Magnet; whereas I ſaid they uſed only to be attracted. The next morning I tryed again: And then the Magnetiſm of the Wires was totally deſtroyed, as I related to the Society. This Experiment I repeated divers times, and on divers Wires this Winter, and commonly find, that, all the day, coyling will evacuate the Magnetiſm: But that it will not abſolutely do it in the Evenings. But whether it will do ſo in Summer, or all Weathers, or whether it ſucceedeth thus only in different times of the Day, I muſt leave to farther Tryals. I well know that the Orb of the Activity of Magnets, is larger, or leſs, at different times. That noble Magnet in the Society's Repoſitory found in *Devonſhire* by Dr *Cotton*, is known in ſome Weathers (or at ſome times) to keep a Key, or other piece of Iron, ſuſpended to another Iron at 8, 9 or 10 foot diſtance. But at other times, the Iron will drop down at the diſtance of 3 or 4 foot from the Magnet. If I lived nearer, I would obſerve the *Phænomenon* more nicely: Particularly whether there be any difference therein in the Evening, and the reſt of the Day. Now whether at all, or how far this may reach the forementioned caſe, I cannot ſay, not having as yet ſufficiently experimented the matter.

Finding the caſe thus with *Coyled*, or *Bent Wire*, I was minded to try the event of *Twiſting* of Iron Wire from end to end, after it had been well Touched. The Succeſs was, The *Verticity* was always weakened, and ſometimes inverted. And when it was ſo, the Load-ſtone did accordingly commonly Repel or Attract, all one as if the Twiſting the Wire had given a new Touch the contrary way.

But in ſome Wires ſo twiſted, the Verticity was wholly deſtroyed, or rather much confuſed. For I found by drawing one of the Poles of the Loadſtone along near the ſides of the Wire, that in ſome places it would Attract, in others Repel, and ſo attract and repel all along the Wire. Nay, I fancied in ſome places, that one ſide of the Wire would be attracted, the other repelled by one and the ſame Pole of the Loadſtone.

To theſe odd changes, I could add divers others, which the *Twiſting* produced. But theſe do ſufficiently ſhew that the Magnetick Virtue is put into great confuſion by the Violence exerted upon the Wire by *Twiſting*: Which not only ſeparateth the fibres of the Iron (as may be ſeen with the Eye, eſpecially aſſiſted with a Microſcope) but alſo changeth their Situation from Longways to Skrew-ways.

This being the Succeſs of *Twiſting*, I was next minded to try what would be the iſſue of *Splitting* or *Cleaving* touched Wires: Particularly whether they would exert the ſame effects that Magnets are ſaid to do, when ſawn in two Meridionally. Concerning which Dr *Ridley* ſaith, " Cut a piece from a Magnet ſtone Meridionally, and that " end which was placed S. when it was whole, being ſe- " vered, will turn North, although naturally at firſt it was " the S. point. But Mr *Barlow* (who ſeems to have been a more judicious and faithful Author, is of a contrary mind, and ſaith, That the Poles of ſuch a piece of Magnet, when ſevered, will abhor the ſame Poles, to which it grew in the whole Magnet. But he ſubjoyns, " But here you muſt " beware of an error, which ſome unhappily have entan- " gled themſelves withal, who beholding the aforementi- " oned diſcord, wrongfully ſuppoſed, that if both theſe " Magnets the greater and the leſs [*i. e.* the piece cut " off] were conveniently placed to ſwim in Water, the " little one would not with his end point unto the South of " the Earth as it did in the Magnet being entire, when it " was a part of the true North-end, but would point contra- " rily. There is (ſaith he) no manner of any ſuch altera- " tion, but that both the great one, the little one, (and all " the like, that are cut Meridionally one from another) will " abſolutely point the very ſame way which the entire one " did. Only the Meridian will be ſomewhat removed, *&c.*

Treat. of Magnet. Bodies and Motions. Ch. 9.

Magnet. Advertiſements. Ch. 2.

Dr *Gilbert* (whoſe Judgment and Fidelity is not to be queſtioned) is as expreſs as his Friend Mr *Barlow*. For (*L.* 2. *c.* 5.) ſpeaking of a Magnet divided, and ſhewing how that the parts which in the whole Stone coaleſced, do by Separation repel one another, he ſaith, *That what was the N. and S. Pole before, is ſuch ſtill. Non enim* (ſaith he) *immutatur Verticitas (quod malè affirmat B. Porta.) Nam licet* [*Poli ſeparati*] *non conveniunt, ut alter ad alterum inclinaret ; tamen uterque in idem horizontis punctum convertuntur.*

How the Truth lieth between Dr *Ridley* and the two later Authors I cannot determine, having never ſo cut a Magnet. But by the Magnetick Laws, as well as from the Authority of Dr *Gilbert* and Mr *Barlow*, I doubt not but the later is the trueſt opinion.

But in *Cleft Wires* the caſe is very uncouth. Oftentimes the Poles are quite changed : So that what was the *North*, becometh the *South* Pole of the Wire in all reſpects ; I mean, not only turning, but alſo embracing, or avoiding the Poles of the Loadſtone, as if it had received a new, and contrary Touch. Sometimes one half of the Wire will retain its Magnetiſm, which it had before ſplitting, and the other half have it quite changed. Sometimes no change at all will enſue, only the Magnetiſm be much weakened ; as indeed it always is in all the Experiments where the Wire is ſplit. (But generally, where one of the halves hath ſuffered change, the other not, I have obſerved, That 'tis the thinneſt and weakeſt that hath been changed, and the thickeſt hath retained its Touch.) Sometimes where one of the Split Halves receiveth an *inverted Verticity*, or ſeemeth to have no Verticity at all, one of its Ends will incline to one of the Poles of the Magnet, not according to its Touch, but in an inverted order, and the other end be attracted indifferently by both the Poles of the Loadſtone. And in ſome caſes, that End ſhall be attracted by one Pole, but be neither attracted nor repelled by the other; but ſtand as it were heſitating whether it had beſt fly to, or from that Pole of the Loadſtone. Only if that Pole of the Magnet be too near, then that end of the Wire will conſtantly fly thereto: As indeed it is the nature of all Magnets and Magnetick Bodies to do, when they touch, or approach very near one another, tho they repelled before.

The Cauſe of theſe great Changes in touched Wire produced by *Splitting*, I have ſometimes imagined to ariſe from the Violence exerted thereon by Bending. But in ſome Wires that I ſplit, or cleft with very little bending, one Half hath been utterly changed, the other not. In others that I cleft, by ſuffering the Halves to bend as much as they would, no change hath been; and ſome have quite ſuffered change.

Sometimes I have imagined that the Splitting the Wires in a N. or S. poſition, or that the beginning to ſplit at the N. or S. end of the Wire firſt, might be the cauſe of this contraverſion of the Poles. But tryals ſhewed there was little in any of this.

Thus I would have done with *Split* or *Cleft Wires*; but there is one thing very ſurprizing, which will deſerve to be mentioned, *viz.* *That the laying one, or the other ſide of the Half uppermoſt*, will cauſe a great alteration in its Tendency, or Averſion to the Poles of the Magnet (as I have ſaid.) But if you lay the contrary ſide of that Half uppermoſt, the ſame End ſhall be attracted by one, and repelled by the other Pole of the Magnet. In other pieces, where the Ends are regularly attracted or repelled, only in an inverted order (as if new touched,) if it lay with the round ſide uppermoſt at that time, and be then turned upſide down, *viz.* the flat cleft ſide uppermoſt, 'tis ten to one if one of the Ends be not either attracted by both the Poles, or repelled by both; or elſe attracted or repelled by one, and heſitates as to the other: For ſo it often befalls.

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The Cauſe of this lubricity of the Magnetiſm, I imagined might be, becauſe the ſides or edges of the Wire had received contrary Poles by Splitting: And conſequently were turned topſy-turvy, that what was the N. might then be the S. edge of the Half. But I could never diſcover, but that the ſides of each end, or of any other part, were the ſame, when I held the Loadſtone to one or the other ſide. Which indeed I always did in every Experiment for greater certainty ſake.

My Hand being thus in, I was minded to repeat the old Experiment of Touching Wires, *by rubbing them backwards and forwards* with one of the Poles of the Loadſtone, becauſe it might probably give ſome Light into the aforementioned ſtrange *Phænomena.*

Mr *Barlow* was I think the firſt (at leaſt he ſaith he was) that diſcovered the error of this way of Touching, *viz.* That it weakeneth or much hurteth the Touch. This I tryed, and found what is ſaid, not only to be true, but alſo that the Reaſon thereof is, *Becauſe the Poles of the Wire, or Needle, ſo touched, are not at the Ends, but in, or near the Middle of the Wire or Needle.* Sometimes one is near the Center, the other at one or both Ends. For in ſome Wires ſo touched, both the Ends of the Wire would be Attracted by one Pole of the Loadſtone, and Repelled by the other. And in ſuch caſe the Repelling Pole always found a Sympathetick part near the Center of the Wire. In others (eſpecially where a Verticity ſucceeded, as ſometimes it will do, and that pretty ſtrongly too, in ſuch a caſe) the Verticity would be inverted, and the Ends of the Wire be attracted and repelled in a direct contrary manner to the Natural Form. And the Reaſon of all this will be manifeſt from theſe following Experiments.

I touched a Wire from end to end with only one Pole of the Magnet. This gave ſo vigorous a Touch, that I am almoſt of opinion, *It is the beſt way of Touching.* The Conſequence was, The End where I began always turned contrary to the Pole that touched it. I again touched the ſame Wire, and others too with the other Pole of the Magnet, from the ſame end, and then that end turned the contrary way. *E. G.* Mark one end of a Wire for the North-end, and Touch that Wire, by drawing the N. Pole of the Magnet divers times along the Wire from the N. to the S. end: This Wire ſo touched ſhall have a vigorous Verticity; but the North-end ſhall ſtand South. But if you touch that or another Wire, (for it is all one, becauſe the Latter deſtroys the Former Touch; I ſay, if you Touch) by drawing the N-Pole of the Magnet from the S. the N-end of the Wire, then this N-end will turn N. And ſo it will do the ſame, if you Touch with the Southern Pole from the N. to the S.

Laſtly, There is one Experiment more doth yet give farther light into what goeth before, *viz.* I touched an Iron Wire exactly in the middle with only one Pole of the Loadſtone, without drawing it backwards or forwards. The Event was, That in that place that Pole of the Wire was, and the two Ends were the contrary Pole of the Wire; and were accordingly Repelled or Attracted by the Poles of the Loadſtone: And the Middle, and an inch or more on each ſide was attracted by the Pole only that Touched it.

And now, if we reflect upon what hath been ſaid, and compare the foregoing Experiments one with another, they not only illuſtrate one another, but ſeem to lay open a fair way towards the diſcovery of a great many of the intricate *Phænomena* of Magneticks. And therefore, beſides the Novelty, their Uſefulneſs may, I hope, render theſe Experiments and Obſervations acceptable to this Illuſtrious Society.

VIII. A